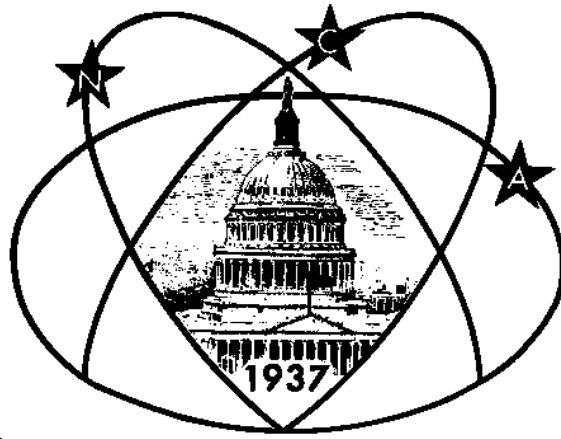


# Star



# Dust

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## Jean Swank: Zooming Around Neutron Stars and Black Holes

*submitted by Gary Joaquin*

The Rossi X-ray Timing Explorer has been measuring the X-ray signals of gas spiraling down the gravitational wells to the compact stars in close binaries. Some signals from neutron stars, like pulsations, differ from those that come from black hole candidates, in accord with our expectation that the gas can crash on the surface of the neutron star and undergo nuclear reactions there, while it may disappear quietly into a black hole. Other signals are very similar, as would be the case for a disk precessing around the gravitational point without regard to the detailed nature of the compact star.

Accreting binary neutron stars and black holes are often seen at optical and radio

wavelengths as well as with X-rays. Radio evidence is growing that gas is ejected in jets along the rotation axes, especially when the compact object is rotating fast and gas is flowing in from the companion star at a high rate. Correlations with the X-rays may show how.

Jean Swank is an astrophysicist at the Goddard Space Flight Center. She joined the Laboratory for High Energy Astrophysics in 1977 after working there as an NAS/NRC Resident Research Associate, returning to research from teaching positions at California State University at Los Angeles, Chicago State College, and Middle East Technical University. She obtained her Ph.D. in theoretical physics

from the California Institute of Technology.

She has worked on data from many space missions, concentrating on galactic X-ray sources, from normal stars to compact stars. The X-ray Timing Explorer (RXTE), the largest area X-ray experiment that has flown, was launched at the end of 1995. During the long gestation of RXTE, Dr. Swank became its Principal Investigator and Project Scientist. RXTE has discovered new signatures of neutron stars and black holes. Dr. Swank has been concentrating on maximizing its few years of opportunity to study these phenomena.

## Review of Steve Robinson's Talk on the Observation of Gamma-Ray Bursts

*by Nancy Grace Roman*

### The Huntsville Workshop

The program opened with the playback of a half-hour video of the beginning of a workshop in Huntsville, Alabama for amateur astronomers. The purpose of the workshop, which was jointly sponsored by NASA and the AAVSO (American Association of Variable Star Observers), was to interest active amateurs in trying to observe the afterglows from gamma-ray bursts. After opening remarks by Janet Mattei, the director of the AAVSO, Jerry Fishman of the Marshall Space Flight Center, who was the Project Scientist for BATSE, reviewed the purpose of the workshop and then gamma-ray astronomy with an emphasis on the Compton Gamma Ray Observatory (CGRO). He particularly emphasized BATSE, the instrument de-

signed to detect gamma-ray bursts. This instrument could cover about 85% of the sky every day. Almost all Gamma-ray sources are variable on scales from milliseconds to days. (The Crab is one of the few exceptions.)

Fishman proceeded with several definitions. A "hypernova" is the collapse of a massive star. Such a source can be the brightest gamma-ray source in the sky one night and undetectable the next. "High-energy astrophysics" is not just astronomy using X-rays and gamma rays, as is often assumed. It is the astrophysics of high-energy regions, such as the solar corona, flares in low mass stars, the centers of galaxies, and interstellar shocks. The soft X-ray repeaters are "Magnestars". They are quite different from the more common

gamma-ray burst sources. Black holes come in two varieties. Some are comparable in mass to the sun; others, supermassive black holes, have masses a million up to 100 million times the mass of the sun. The latter are found in the centers of galaxies.

The electromagnetic spectrum is very broad, extending from  $10^{20}$  to  $10^{22}$  electron volts. High-energy phenomena are observable throughout this range. There are other emissions from high-energy sources. Gamma-ray bursts may produce neutrinos. There are jets of radio emission from these sources. Centaurus A has X-ray jets perpendicular to its dust disk. Black holes emit blobs that are expanding so rap-

*(Continued on page 2)*

## NCA Events This Month

### The Public is Welcome!

NCA Home Page: <http://capitalastronomers.org>

**Fridays, October 6, 13, 20, and 27, from 7:00 - 10:00 P.M.**

Telescope-making and mirror-grinding classes at American University, McKinley Hall, Basement (Room 9), Nebraska and Massachusetts Avenues, N.W. However, on October 20 and 27, if the weather is clear, class may be canceled so that the instructor can go out star-gazing himself, instead, because the moon will be near new or 3<sup>rd</sup> quarter. Call or email Guy Brandenburg to confirm: 202-635-1860 or [gbranden@earthlink.net](mailto:gbranden@earthlink.net).

**Fridays, October 6, 20, 27. 8:30 P.M.**

Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia; 6007 Ridge View Drive (off Franconia Road between Telegraph Road and Rose Hill Drive). Call Bob Bolster, (703) 960-9126 before 6:00 p.m.

**Saturdays, October 21, beginning 6:00 P.M.** - Open House at Hopewell Observatory. NCA members,

families, and guests, only, are invited to enjoy the autumn sky at Hopewell Observatory. View the Milky Way and numerous deep-sky objects as well as the planets Uranus, Neptune, Saturn, and Jupiter (midnight in Sept., 10 p.m. in Oct.). On Oct. 21, sunset is at 6:23, astronomical twilight ends at 7:52, and the Moon rises at 2:06 a.m. See more information and directions on Page 3.

**Saturday, October 7, 5:30 P.M.** -

Dinner with the speaker and NCA members at the Cesco Trattoria, 4871 Cordell Ave., Bethesda MD. See the map and directions on Page 6.

**October 7, 7:30 P.M. - NCA meeting,**

at Lipsett Auditorium in Building 10 at NIH, will feature Dr. Jean Swank: "Zooming Around Neutron Stars and Black Holes".

See Page 4 for more National Capital area astronomical doings. To join NCA, use the membership application on Page 7.

## Meteor Showers

### October Radiants

Full Moon: October 13

#### Major Activity

Radiant	Duration	Maximum
Orionids (ORI)	October 15-29	Oct. 20 at 21:46 UT

#### Minor Activity

Radiant	Duration	Maximum
Arietids (Autumn)	September 7-October 27	Oct. 8/9
Delta Aurigids (DAU)	September 22-October 23	Oct. 6-15
Eta Cetids	September 20-November 2	Oct. 1-5
October Cetids	September 8?-October 30?	Oct. 5/6
October Cygnids	September 22-October 11	Oct. 4-9
Draconids (GIA)	October 6-10	Oct. 9/10
Epsilon Geminids (EGE)	October 10-27	Oct. 18/19
Northern Piscids	October 5-16	Oct. 12/13

#### Daylight Activity

Radiant	Duration	Maximum
Sextantids	September 24-October 9	Sept. 30-Oct. 4

Source: <http://comets.amsmeteors.org/meteors>

## Steve Robinson

*(Continued from page 1)*

idly that the expansion can be detected in one day in spite of the distance to the sources. Cosmic rays are thought to be accelerated in supernovae.

Fishman listed both past and recent X-ray and gamma-ray satellites and two upcoming ones, with emphasis on CGRO. One of the up-coming satellites, Swift, to be launched in 2003, is being designed both to provide more accurate source locations for gamma-ray bursts and to transmit the information required to locate the source in the visible to the ground rapidly, thanks to substantial on-board processing. He also provided a list of satellites that have made or are making high-energy observations. Images in gamma-ray sources are not photographs. Photons are detected individually and the data used to produce "pictures". Multiple instruments and multiple spacecraft have provided information that, when combined, increase our understanding of these sources.

### Steve Robinson's Talk

Robinson spent most of his talk describing his web site ([www.highenergyastro.homestead.com](http://www.highenergyastro.homestead.com)). It was created to encourage amateurs to search for the afterglow from gamma-ray bursts and to provide the information they will need for the search. He is a computer expert and did not attempt to answer astrophysical questions. He had played with gamma-ray bursts for only about one month before the conference. He will provide references to experts.

His Web site provides links to information and charts for new bursts, including error boxes. It also has a link to a discussion of bursts and of the workshop. He emphasized several times that the afterglow must be observed very soon after the burst - at least within six hours and, in the D.C. area with its bright sky, within 3 hours. Most of the hits on his site are from people looking for the charts. There is a link to the AAVSO home page that, in turn, has a link to the gamma-ray burst discussion group. There is a membership fee of about \$25 for the latter. He recommends joining it if you wish to observe the transients from gamma-ray bursts.

BATSE observed more than 2690 gamma-ray bursts. Before CGRO was launched, people thought that the bursts were from within our Milky Way galaxy. BATSE

*(Continued on page 3)*

## Steve Robinson, continued

(Continued from page 2)

showed that the distribution over the sky was quite uniform, indicating that the bursts must be either extremely close to the Sun or at cosmological distances. Spectra of a few sources that could be identified in the visible showed that they had large red shifts and established the cosmological nature of most bursts. A gamma-ray burst can release in 20 seconds more than the entire energy of many galaxies. A burst in a spiral arm adjacent to the Sun's would light the night sky as brightly as the Sun for 20 or 30 seconds.

It takes skill and telescope availability to find the bursts within the short time available. Professional telescopes are booked too far ahead. Therefore NASA wants the many amateurs to observe the transients. CGRO was brought down early this summer. Beppo Sax is still observing but while CGRO had real time communication so that the ground knew about a burst in 2 seconds, Beppo Sax requires up to 2 hours to alert the ground of a burst.

Bursts last 20 to 30 seconds on the average, although the duration can range from 1 to 1000 seconds; the transients last longer. Transients result from the excitation of material through which the radiation from the burst passes. GCN is a network that alerts amateurs to bursts and gives them the location and error circle size. Amateurs then take a picture of the field and compare it with an earlier picture of the same region. A ninth magnitude transient was observed by a robotic telescope after 100 seconds. It dropped to 18<sup>th</sup> mag. very quickly (in 3 hours), then decreased in brightness more slowly. Only 40 transients have been observed so far; NASA hopes that the amateur community can add to this number. A 13 to 18-inch telescope with good stability and good tracking, for perhaps 25 minutes, is required to observe the transients. Robinson's Web site provides a list of these requirements and software.

The burst itself is not visible in the optical region. You can only see the afterglow from the radiation traveling through the surrounding material. Thus, we only know where it came from. Some bursts do not leave a transient. We do not know when and at what place in the spectrum the afterglow is the brightest. Not every burst leaves a trail. It is not known if there is a correlation between the intensity of the burst and the brightness of the trail. CGRO

observed about one burst per day; a single observer may have access to only one or two per month. It is expected that HETE II will see more bursts.

The HST found very faint galaxies where the transients were observed. These galaxies have Z about 1 - 2. Almost certainly, gamma-ray bursts are something happening early in the universe. They appear to have some relation to high intensity star formation. All the energy of two solar masses might be converted to gamma rays. The energy from a supernova takes time to get out; gamma-ray bursts appear to be instantaneous.

CGRO had a resolution of 2° - 3° while a CCD camera has a field of only 10' - 20'. HETE II, which is to be launched October 6 of this year, will have a 10' error box and can alert the ground within 1 to 2 seconds. Another upcoming satellite, GLAST, to be launched in 2005, will get optical images immediately.

Robinson makes his charts from the USNO survey that goes to 22<sup>nd</sup> mag. These charts show the error circle as well as the central position for the burst. He also provides camera and burst-hunting procedures and software. He takes 65 - 70 min. to get the first image using an 18-inch telescope with an ST9 chip. Although data from BATSE were collected for 9 years, Robinson's Web site only includes the ones since March of this year.

Robinson sees his role as a messenger and an inviter. Two bursts have been captured by amateurs compared to 40 by professional observers. The Aquino group in Buffalo made the first amateur observation of a transient with a 40-year old hand-made telescope and very poor hand guiding. (The mount could guide automatically for only 20 seconds.) They took 11 5-minute exposures that they added together. Arne Hendon at the USNO in Flagstaff provided substantial image enhancement. Amateur observations on Cloudcroft respond automatically to a request. Robinson hopes that NCA members will join him in searching for optical transients. There are, perhaps, three standard formats for the data in a burst announcement, but each format is easy to understand.

## Exploring the Sky

*Exploring the Sky*, a joint presentation of the National Park Service and the National Capital Astronomers, continues Rock Creek Park near the Nature Center, in the fields just south of the intersection of Military and Glover Roads N.W.

The remaining sessions for this year are  
10/28 - 7:30 P.M.  
11/18 - 7:00 P.M.

Times are EDT except EST in November.

NCA members are urged to bring their telescopes to these sessions. Members without telescopes are also needed to answer questions from the public.

For additional information, call the Rock Creek Nature Center at (202) 426-6829 or NCA's Joe Morris at [joemorris@erols.com](mailto:joemorris@erols.com)

You may also check the Internet sites:  
<http://www.nps.gov/rocr/planetarium>  
<http://www.capitalastronomers.org>

## Open House at Hopewell

Saturday, October 21, beginning 6:00 p.m. If you wish, come any time after 6:00 p.m. and bring your prepared picnic dinner. Coffee, tea, and cocoa will be provided by the Hopewell Corporation.

Directions: (1) From the Beltway (I-495) go west on I-66 25 miles to Exit 40 at Haymarket onto U.S. 15. (2) Turn left on U.S. 15 at the end of the exit ramp. (3) Go 0.3 mile to traffic light, turn right onto Va. 55. (4) Go 0.8 mile to Antioch Road (Rt. 681) and turn right. (5) Go 3.2 miles to the end of Antioch Rd. and turn left onto Waterfall Road (601). (6) Go one mile and bear right onto Bull Run Mountain Rd. (Rt. 629). (7) Go 0.9 mile on 629 to narrow paved road at right with an orange pipe gate (Directly across from an entrance gate with stone facing). (8) Turn right through pipe gates, go 0.3 mile to top of ridge, and around the concrete building and towers. (9) Continue on dirt road through the white gate and woods a few hundred feet to the observatory. Park along the road short of the buildings.

If it is raining or hopelessly cloudy the event will be canceled. For further information call (703) 960-9126. Observatory phone: (703) 754-2317.

## Other National Capital Area Meetings, etc.

**U.S. Naval Observatory (USNO)** Monday nights at 8:00 p.m., except on Federal holidays: USNO public nights in Northwest Washington, D.C. (off Massachusetts Avenue). Held regardless of cloud cover. Information: USNO Public Affairs Office, 202/762-1438.

**Department of Terrestrial Magnetism (DTM) Carnegie Institute of Washington** 5241 Broad Branch Road, N.W. Washington, D.C. Wednesdays at 11:00 a.m. in the Seminar Room of the Main Building.

October 18, David E. Trilling, Department of Physics and Astronomy, University of Pennsylvania, "Linking our Solar System and Extrasolar Planetary Systems"

Call (202) 686 4370 to confirm that there have been no cancellations.

Source: <http://www.ciw.edu/DTM-seminars.html>

**Goddard Scientific Colloquium** — Due to construction in the Building 3 auditorium, the colloquia will be held at 3:30 p.m. on Fridays in the Goddard Space Flight Center Building 8 auditorium. If you plan to attend and do not have a NASA badge, please contact Carol Krueger, at (301) 286-6878, at least 24 hours beforehand.

LATE NEWS! Construction in Building 3 has been postponed. The Scientific Colloquium will be held at 3:30 p.m. on Fridays in the Building 3 auditorium until the work is re-scheduled.

Coffee and tea will be served in the Lobby at 3:00 p.m., courtesy of GEWA. If you plan to attend and do not have a NASA badge, please contact Carol Krueger, at (301) 286-6878, at least 24 hours beforehand.

October 13, Max Tegmark, University of Pennsylvania, "Zeroing in on Cosmological Parameters"

October 27, Maria Zuber, MIT, "Seasonal Variations, Climate Change and the Thermal History of Mars from Mars Global Surveyor Topography and Gravity"

Source: <http://lheawww.gsfc.nasa.gov/users/djt/colloq/>

**Montgomery College's Planetarium** Fenton St. in Takoma Park, MD.

October 21, Saturday, at 7:00 P.M. "How are Stars Born?"

Source: <http://www.mc.cc.md.us/Departments/planet/>

**Northern Virginia Astronomy Club (NOVAC)** meets at 6:00 p.m., the second Sunday of each month, at Lecture Hall 1 on the Fairfax campus of George Mason University. 703 803-3153.

October 8, "Telescopes and Tinkerers", Here's a chance to get a close look at what NOVAC members use to observe. Besides commercial scopes, many NOVAC members enjoy making their own equipment, whether building complete scopes or just tweaking commercial parts. Source: <http://novac.com>

**University of Maryland Observatory** on Metzert Road. Open house on 5 and 20 of each month. Each open house program consists of a 20 to 30 minute slide presentation in the lecture hall (which is now air conditioned!) followed by telescope viewing (weather permitting) of various astronomical objects.

October 5, Thursday, two shows: 8:15 p.m., 9:00 p.m., Dr. Andrew Harris, "Searching for the Earliest Galaxies"

October 20, Friday, 9:00 p.m., Dr. Marv Leventhal, "Anti-particles at the Center of the Milky Way". Info: (301) 405-3001 Source: <http://www.astro.umd.edu/openhouse/>

**Greenbelt Astronomy Club** meets on the last Thursday of each month (except holidays) at 7:30 p.m. at the Howard B. Owens Science Center, 9601 Greenbelt Road, Lanham, MD 20706. (Call the Science Center at 301-918-8750 or (301) 441-4605 to confirm meeting dates). Club meetings are open to the general public.

October 26, Dr. David A. Batchelor, "The Life Cycle of Stars" Source: [lheawww.gsfc.nasa.gov/docs/outreach/gac/GAC.html](http://lheawww.gsfc.nasa.gov/docs/outreach/gac/GAC.html)

NASA/GSFC LEP Seminar Laboratory for Extraterrestrial Physics Brown Bag Seminar. The Laboratory for Extraterrestrial Physics (LEP) at NASA's Goddard Space Flight Center conducts weekly science seminars Fridays at noon in Room 8 in Building 2 at Goddard. Since the seminar is conducted during the lunch hour, the audience often brings their lunch.

October 6, No seminar scheduled.

October 13, Nikolai Ostgaard (U. of Oslo), "Energy Analysis of a Substorm Based On Remote Sensing Techniques"

October 20, Ken LaBel, NASA/GSFC, Radiation Environment Mitigation: Part II

October 27, David Sibeck, JHU/APL, Laurel, Maryland, "Foreshock Preconditioning and its Magnetospheric/Ionospheric Effects".

Source: [http://lepjas.gsfc.nasa.gov/~seminar/lep\\_seminar.html](http://lepjas.gsfc.nasa.gov/~seminar/lep_seminar.html)

**Goddard Engineering Colloquia**

All colloquia are held at 3:30 p. m. on Mondays in the Building 3 Auditorium, unless otherwise indicated below. Coffee and tea will be provided in the auditorium lobby starting at 3:00 p.m., courtesy of the Goddard Employee Welfare Association.

October 2, Bill Watson, GSFC Rapid Spacecraft Development Office, "Using the Spacecraft Supermarket: Results and Lessons Learned"

October 16, Norden Huang, NASA/GSFC, "Should We Bury or Praise Baron Jean Baptiste Joseph Fourier?"

October 23, Gary Hudson, Rotary Rocket Company, "Future Commercial Space Transportation: Challenges and Opportunities",

October 30, Howard McCurdy, "Space Policy in the Next Fifty Years: Will It Be Faster, Better, Cheaper?"

Note: Individuals not badged for entry into Goddard should obtain the current procedure by contacting Main Gate security at 301-286-7211. Source: <http://ecolloq.gsfc.nasa.gov/sched.html>

### Deadline for November *Star Dust*: October 15



Please send submissions to Elliott Fein at [elliott.fein@erols.com](mailto:elliott.fein@erols.com).

Text must be in ASCII, MSWord, or WordPerfect. Graphics in BMP is best. Thanks.

# Mid-Atlantic Occultations and Expeditions, October and Early November 2000

by David Dunham

## Asteroidal Occultations

DATE	Day	EDT/ EST	Star	Mag	Asteroid	dmag	s	in.	Location
Oct 9	Mon	19:29	GSC62722483	10.7	Interamnia	1.2	15	8	Carolinas
Oct 9	Mon	21:44	ACT68970229	10.3	Mashona	3.7	7	8	s. Florida
Oct 23	Mon	22:38	GSC57820030	10.0	Juno	0.5	24	8	Maine
*** Dates and times above are EDT, those below are EST or specified ***									
Nov 6	Mon	0:05	SAO 147199	9.2	Myrrha	4.5	24	3	s. Georgia
Nov 20	Mon	4:40	mu Geminorum	2.9	Sulamitis	10.6	13	0	Arizona; MST

The locations are approximate and could shift towards us with updates.

## Lunar Grazing Occultations

DATE	Day	EDT/ EST	Star	Mag	% alt	CA	Location
Oct 19	Thu	2:22	SAO 078867	8.4	62-	39	13N Gaithersburg & Ellicott C., MD
Oct 22	Sun	4:57	SAO 098907	8.5	27-	42	5N Doswell, VA
**** Dates and times above are EDT, those below are EST ****							
Nov. 3	Fri	18:41	SAO 189638	7.7	46+	31	4S Williamsburg, VA & Raleigh, NC
Nov. 5	Sun	18:44	ZC 3284	7.0	65+	35	3S Germantown & Woodbine, MD
Nov. 7	Tue	20:40	30 Psc	4.4	83+	42	4S near Youngstown, OH

(Oct. 19: Also near Sterling, VA; s. of Mt. Airy & n.w. Baltimore, MD  
Nov. 3 & 7: Possibly no DC-area expedition.)

## Total Lunar Occultations

DATE	Day	EDT/ EST	Star	Mag	% alt	CA	Notes
Oct 5	Thu	22:25	D SAO 188112	6.8	56+	17	65N Sp. K3
Oct 6	Fri	22:32	D X047994	7.0	65+	22	80N
Oct 7	Sat	22:46	D ZC 3084	6.7	74+	28	56N Sp. K1
Oct 16	Mon	23:08	R ZC 0718	6.0	83-	23	79N Sp. K4
Oct 17	Tue	0:09	R ZC 0726	7.0	83-	34	55S Sp. G2
Oct 17	Tue	1:22	R 97 Tauri	5.1	82-	48	33S Sp. A7
Oct 17	Tue	3:48	R ZC 0736	6.4	82-	69	71N Sp. F3
Oct 17	Tue	23:02	R Y Tauri	6.5-9.2	74-	12	64S semi-regular variable
Oct 18	Wed	0:11	R ZC 0881	6.0	73-	25	69S Double, 2 <sup>nd</sup> mag. 7.6, 0"6, P318
Oct 18	Wed	0:31	R SAO 077596	7.3	73-	29	62N Sp. B9; & 6 8 <sup>th</sup> -mag. to next
Oct 18	Wed	6:13	R ZC 0905	6.9	71-	69	67N Sp. A0; very close double
Oct 18	Wed	23:35	R SAO 078750	6.8	63-	8	85N Sp. M
Oct 19	Thu	1:06	R 36 Gem	5.3	62-	25	86S Sp. A2; ZC 1047; pos. close dbl.
Oct 19	Thu	1:16	R ZC 1054	7.0	62-	38	12S Sp. B9
Oct 20	Fri	1:44	R ZC 1191	6.8	50-	20	79N Sp. M1
Oct 20	Fri	3:02	R SAO 079818	7.1	50-	35	69S Sp. G5
Oct 22	Sun	4:41	R ZC 1464	7.5	27-	29	65S Sp. G5
**** Dates and times above are EDT, those below are EST ****							
Nov 1	Wed	19:28	D ZC 2777	6.7	29+	15	57N Dbl., 2 <sup>nd</sup> mag. 8.5, 8.0", PA 308
Nov 7	Tue	0:07	D psi3 Aqr.	5.0	76+	18	77S Sp. A0; ZC 3428

D following the time denotes a disappearance, while R indicates that the event is a reappearance. If the cusp angle (CA) is less than 30 deg., the time could be 5 minutes or more different for other locations. Mag is the star's magnitude. % is the percent of the Moon's visible disk that is sunlit, followed by a + indicating that the Moon is waxing and - showing that it is waning. Cusp Angle is measured around the Moon's circumference from either the north (N) or south (S) cusp, or horn; all events are on the dark side. Sp. is spectral type, indicating the star's color: O,B: blue; A,F: white; G: yellow; K: orange; M,N,S,C: red.

Phone the IOTA occultation line, 301-474-4945, for weather go/cancel decisions, and other updates, or check IOTA's Web site at <http://www.lunar-occultations.com/iota> for charts and more info.

David Dunham, 2000 Sep. 15

# Getting to the NCA Monthly Meeting

**Saturday, October 7**

**5:30 P.M. - Dinner** with the speaker and NCA members at

Cesco Trattoria  
4871 Cordell Ave.  
Bethesda MD  
phone: 301-654-8333

The restaurant has valet parking. Also, there is 2-hour metered parking on Cordell and Norfolk Avenues. (The meters are in use 9 AM – 10 PM except Sunday). The meters take nickels, dimes and quarters; 50¢ per hour.

**7:30 P.M. - NCA Meeting** at Lipsett Auditorium in Building 10 at NIH. Guest speaker: Dr. Jean Swank.

## Directions to the Meeting Place

**From Rockville Pike (Wisconsin Ave., Rt. 355)**

To get to the parking lot at the South entrance (this will be the entrance for the next three years or so until they finish the new wing) from Rockville Pike, enter NIH at the Metro Entrance: South Drive (traffic light). Go straight ahead. At the third stop sign you will be at the parking lot, but you will have to make a left turn then a right to get to the entrance to the lot. Make a right turn into the lot. Building 10 is just north of the parking lot. Enter the building and follow the signs to the Lipsett Auditorium.

**From Old Georgetown Rd.**, enter at Lincoln Drive (traffic light nearest to Suburban Hospital). Go straight ahead. The second stop sign is at a T. Bear left and the lot will be on the right. Make a right turn into the lot.

**Metrorail Riders** - From Medical Center Metro Station: Walk down the hill, past the bus stops. Continue straight past the anchor. At the second stop sign after the anchor, bear right up the incline into the entrance of Building 10, the tallest building on campus (walking time less than 10 minutes).

**Taking the J2 or J3 buses** from Silver Spring, get off at the Metro stop and follow the directions given for motorists from that point. If coming from Montgomery Mall, get off at the first stop in NIH, before the Clinical Center. There are signs near the ramp for the garage directing you into the side entrance. Walk straight through the building to the Lipsett amphitheater.

## Directions to the Restaurant

Dinner before the meeting will be at 5:30 PM at

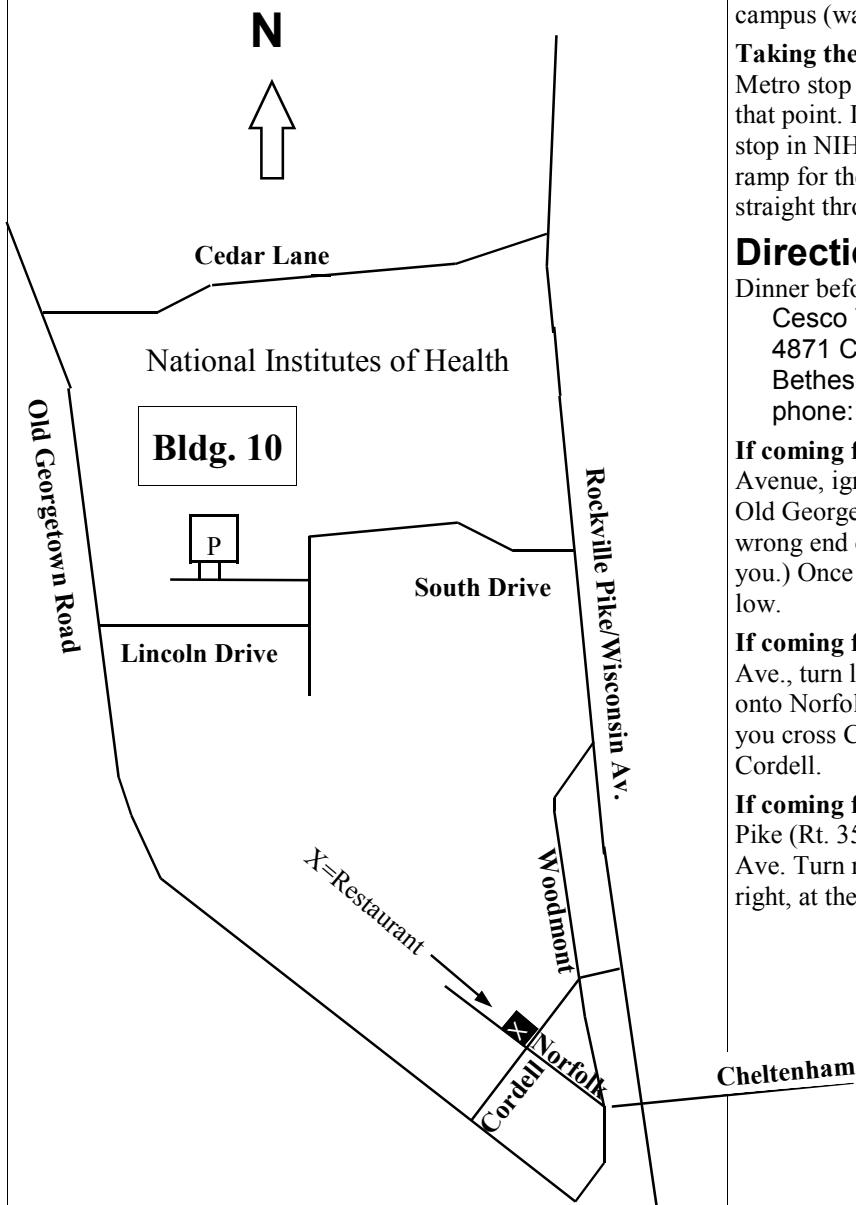
Cesco Trattoria  
4871 Cordell Ave.  
Bethesda MD  
phone: 301-654-8333

**If coming from the District**, when going north on Wisconsin Avenue, ignore all signs for Woodmont Avenue until you pass Old Georgetown Road on your left. (Those signs put you on the wrong end of Woodmont Ave., which becomes one-way against you.) Once past Old Georgetown Rd., follow the directions below.

**If coming from south of Bethesda, go north on** Wisconsin Ave., turn left onto Cheltenham (traffic light). Go straight to go onto Norfolk Ave. The restaurant will be on your right as soon as you cross Cordell Ave. The entrance to the restaurant is on Cordell.

**If coming from north of Bethesda, go south** on the Rockville Pike (Rt. 355). As you pass NIH, make a right onto Woodmont Ave. Turn right onto Cordell Avenue. The restaurant is on your right, at the corner of Norfolk Ave. Its entrance is on Cordell.

**After dinner**, go North (Northeast) on Cordell Ave. to Woodmont Ave. Make a left onto Woodmont. Take Woodmont Ave. north to the traffic light at Rockville Pike (=Wisconsin Avenue) and turn left. Proceed north on the Rockville Pike and follow "directions to the meeting place" at the top of this page.



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#### SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a nonprofit, membership-supported, volunteer-run, public-service corporation dedicated to advancing astronomy, space technology, and related sciences through information, participation, and inspiration, via research, lectures, presentations, publications, expeditions, tours, public interpretation, and education. NCA is the astronomy affiliate of the Washington Academy of Sciences. All are welcome to join NCA.

#### SERVICES & ACTIVITIES:

**Monthly Meetings** feature presentations of current work by researchers at the horizons of their fields. All are welcome; there is no charge. See monthly *Star Dust* for time and location.

**NCA Volunteers** serve in a number of capacities. Many members serve as teachers, clinicians, and science fair judges. Some members observe total or graze occultations of stars occulted by the Moon or asteroids. Most of these NCA members are also members of the International Occultation Timing Association (IOTA).

**Publications** received by members include the monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

**Consumer Clinics:** Some members serve as clinicians and provide advice for the selection, use, and care of binoculars and telescopes and their accessories. One such clinic is the semi-annual event held at the Smithsonian Institution National Air and Space Museum.

**Fighting Light Pollution:** NCA is concerned about light pollution and is interested in the technology for reducing or eliminating it. To that purpose, NCA is an Organization Member of the International Dark Sky Association (IDA). Some NCA members are also individual members of IDA.

**Classes:** Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and schoolteacher training programs that provide techniques for teaching astronomy. NCA sponsors a telescope-making class, which is

described in the *Star Dust* "Calendar of Monthly Events".

**Tours:** On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999. Contact: Sue Bassett wb3enm@amsat.org

**Discounts** are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

**Public Sky Viewing Programs** are offered jointly with the National Park Service, and others. Contact: Joe Morris. joemorris@erols.com or (703) 620-0996.

**Members only Viewing Programs** periodically, at a dark-sky site.

**NCA Juniors Program** fosters children's and young adults' interest in astronomy, space technology, and related sciences through discounted memberships, mentoring from dedicated members, and NCA's annual Science Fair Awards.

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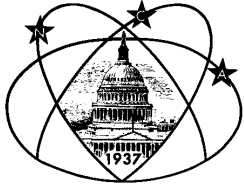
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